Available online at www.sciencedirect.com

SciVerse ScienceDirect

Procedia Environmental Sciences 12 (2012) 878 – 884

Procedia Environmental Sciences

2011 International Conference on Environmental Science and Engineering

(ICESE 2011)

A Correlation Analysis Tool between Jeju Island Groundwater Level and Rainfall*

JinLong Piao[a],Seong Baeg Kim[b]

Department of Computer Education,Jeju National University,66 Jejudaehakno, Jeju-si, 690-756 Korea
[a]herodragon107@hotmail.com,[b]sbkim@jejunu.ac.kr

Abstract

In this paper, we proposed a calculation formula in order to make a correlation analysis tool of the data of the regional groundwater level and rainfall, which were measured and collected. We developed the tool as a web-based analysis tool to manage effectively each regional groundwater level data on the web. We described how to implement the web analysis tool to make Jeju Island groundwater more efficient and scientific management.

*Keywords :*Correlation analysis, web, groundwater level, rainfall.

1.Introduction

In order to enhance the international competitiveness of water industry with high potential and bring a big growth by creating new fields, it is required to make Jeju water industry systematic and advanced through the convergence of the related science and technology. In this paper, we made research on the convergence of water industry and IT in the field of Jeju water industry. In particular, the island is very important in groundwater and related products by industry, the relationship of the Jeju Regional analysis of precipitation and groundwater management, advanced information technology and fusion research has been carried out efficiently[1][2][3][4].

* Following are results of a study on the "Human Resource Development Center for Economic Region Leading Industry" Project, supported by the MEST and NRF.

 doi:10.1016/j.proenv.2012.01.362

2.Correlation between groundwater level and precipitation

TABLE I Type Size for Papersaverage rainfall for the correlation between total water

	계곡평균	후평2수위개이	수산3수위개이	봉프1수위개이	관동4수위개이	봉평장2수위개이	신월수위개이	금학1수위개이	대흘수위개이	상3지수위개이	상배구위개이	장진1수위개이	장진2수위개이
계주강수량평균	Pearson 상관계수	1	0.484	0.440	0.472	0.489	0.663	0.515	0.481	0.400	0.446	0.483	0.494	0.429
	유의확률 (양측)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	201	200	200	200	200	200	200	200	200	200	200	200	200

	서귀평균	후평2수위개이	수산3수위개이	봉프1수위개이	관동4수위개이	봉평장2수위개이	신월수위개이	금학1수위개이	대흘수위개이	상3지수위개이	상배수위개이	서원1수위개이	장진2수위개이
서귀강수량평균	Pearson 상관계수	1	0.530	0.441	0.444	0.410	0.595	0.560	0.446	0.410	0.429	0.470	0.486	0.421
	유의확률 (양측)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	201	200	200	200	200	200	200	200	200	200	200	200	200

	고산평균	후평2수위개이	수산3수위개이	봉프1수위개이	봉평장2수위개이	신월수위개이	금학1수위개이	상3지1수위개이	상배수위개이	서원1수위개이	장진2수위개이	포평1수위개이	포수1수위개이
고산강수량평균	Pearson 상관계수	1	0.545	0.401	0.427	0.564	0.559	0.422	0.422	0.460	0.466	0.400	0.551	0.445
	유의확률 (양측)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	201	200	200	200	200	200	200	200	200	200	200	200	200

	상산평균	후평2수위개이	삼정1수위개이	수산3수위개이	봉프1수위개이	관동4수위개이	원평1수위개이	봉평장2수위개이	신월수위개이	금학1수위개이	대흘수위개이	상3지수위개이	상배수위개이
상산강수량평균	Pearson 상관계수	1	0.485	0.424	0.428	0.480	0.424	0.488	0.551	0.555	0.449	0.459	0.448	0.475
	유의확률 (양측)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	201	200	200	200	200	200	200	200	200	200	200	200	200

Water from the reaction of the Regions based on regional groundwater demand by helping them understand the calculation formula is developed by a computer program. In addition, rising rates of groundwater due to rainfall and groundwater level in the absence of precipitation falling saving rate calculation formula developed by a computer program to analyze it as a way to calculate the formula based on the obtained results, the groundwater level fluctuations due to the groundwater effectively to identify the status of data management techniques have been studied. Here's the correlation between rainfall and groundwater level data analysis are contents.

3.Analysis TOOL

3.1.Nature of data collected

Relationships derived from analysis tools to develop analytical tools based on requirements analysis tool was selected for the programming language. Then, the analytical tools required by the algorithm, user interface, data management techniques and use them to design and implement analysis tools. Finally, for analytical tools developed through a process of full validation test (Verification) were performed.

We develop in the MS Windows7 MS Excel, Access, Notepad, and implement in the Apache server, PHP, MYSQL was. The figure below shows the structure built in the database.

TABLE II infoloc table

Field	Kind	Description
no	int(5)	primary key
cityname_en	varchar(20)	English Name measuring point
direction	varchar(20)	Location of measurement
cityname_ko	varchar(20)	Korean Name measuring point
x	text	The x coordinate of a crisis
y	text	The y coordinate of a crisis

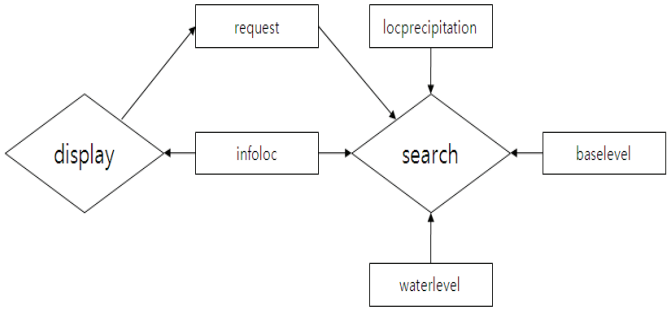

Fig.1. structure of the database

1) infoloc table

Hangul and English names of measurement points allows you matching names. Search for the page displayed on the map mark x, y coordinate information is contained.

2) loc precipitation table

Side and the entire average rainfall for the four corners represent the information.

TABLE III loc precipitation table

Field	Kind	Description
no	int(11)	Primary key
date	date	Date
east	double	The average rainfall in the eastern Jeju
west	double	The average rainfall in the west of Jeju
south	double	The average rainfall in southern Jeju
north	double	The average rainfall in northern Jeju
total	double	Global average precipitation in Jeju

3) water level table

January 1, 2001 ~ July 2009 until 31 points were the groundwater level information indicates.

TABLE IV water level table

Field	Kind	Description
no	int(5)	Primary key
date	date	Date
JDgandeurak	double	Branch level

≀	≀	≀
NMhangyeong	double	Branch level

4) base level table

Branch represents the base level water level measurements.

3.2.Web analytics tool

Select a location on a map, and precipitation and water levels can be found is a program.

Period, precipitation - the water level by setting a range searching can be more meaningful.

TABLE V base level table

Field	Kind	Description
no	int(5)	Primary key
cityname	varchar(20)	English Name measuring point
baselevel	double	Branch level

Viewed from the first map to the right to select the desired area. Maps of the data collected point by clicking the desired area is marked red shift, a black marker selection is activated. Can select multiple areas.

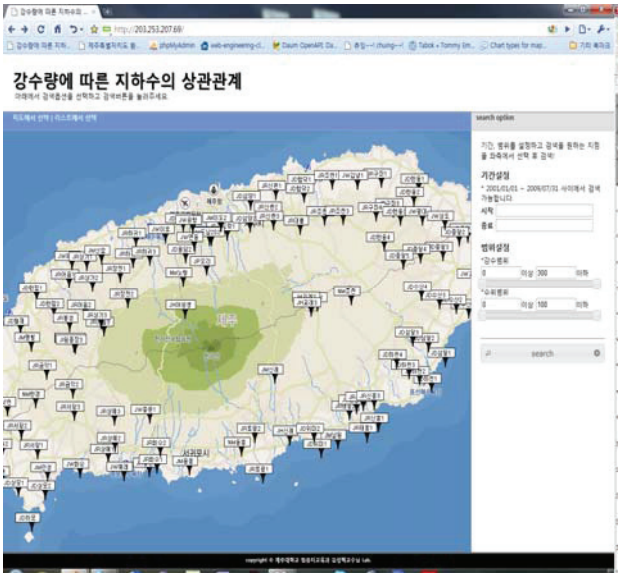

Fig.2. Search Page - Select from map

Seeks the area on a map, you may prefer to select the blue bar above the 'list' to choose a simple click you can choose from a list of the desired area.

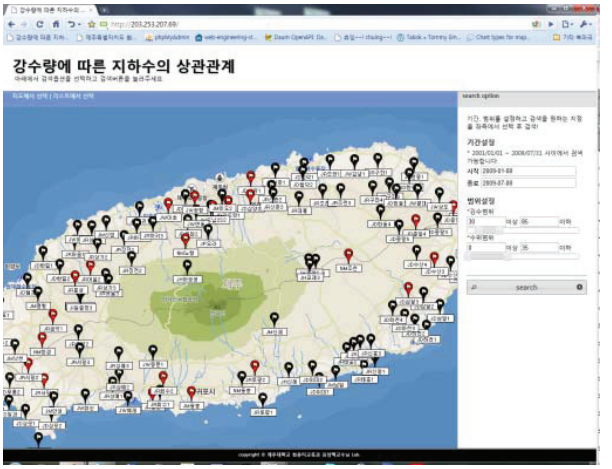

Fig.3. Search Page - Choose from list

Once you have selected the desired area of inquiry to look at the right time and the rainfall, the water level is set for a range. The start and end time for me to set up. Khan, a small calendar when you select input is active, you can specify a date. 2009/07/31 2001/01/01 Within period you can choose from.

Fig.4. set the time period you want to search

Regional rainfall and water levels, respectively 0-300, 0-100 using the slider 42 can specify a range.

1) Data Processing

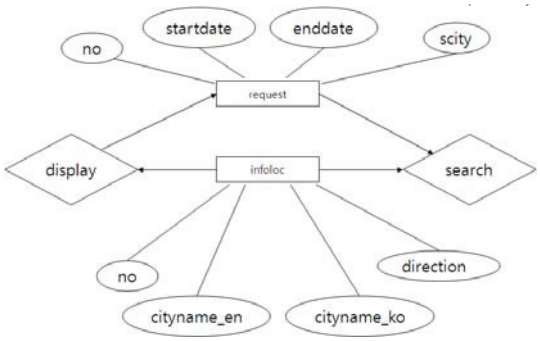

Fig.5. ER Diagram

First, infoloc the name of each branch (cityname_ko) get the screen (display) on the show. Second, users can search from the start date and (startdate), Search end date (enddate), search for points (scity) is sent to search the input received.

2) search

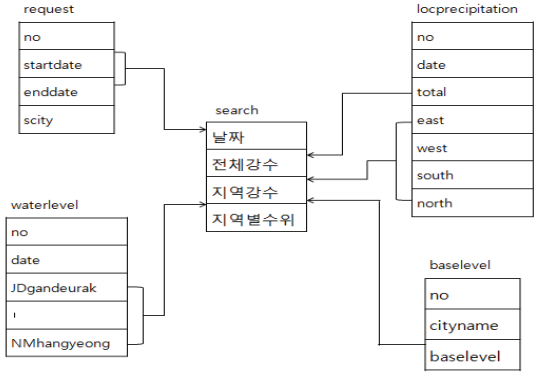

Fig.6. database relationships

Second, display request received from a search using the required data is processed. Search on the start date and end date display gets $ start date, $ end date is stored in a "SELECT * FROM info loc WHERE city name_ IN branch," Query by station point of each level by dividing each array $ info ['north'], $ info ['south'], $ info ['east'], $ info ['west'] to save it.

Third, read the data coming each condition is satisfied with the search data. "SELECT date, branch FROM water level WHERE search term" scope of the search query using search term data and the level of "SELECT defense, total, date FROM loc precipitation WHERE search term" query using the search terms in the local precipitation and total precipitation Search for an average.

Fourth, the search results are displayed on the screen. Precipitation data were loaded on the user-defined range of only those materials are highlighted in red.

2005-02-15	29.4193681318681	20.9	6.01	7.82	null	13.32	null	null
2005-02-16	2.490315934065 93	3.6	6.05	7.95	null	13.38	null	null
2005-02-17	2.175480769230 77	5.5	6.07	7.93	null	13.32	null	null
2005-02-18	16.0215659340659	21.6	6.07	8.10	null	13.35	null	null
2005-02-19	1.225377747252 75	2.6	6.09	8.17	null	13.35	null	null

Fig.7. Run the screen

4.Conclusion

In this paper, we examined how the level by regional groundwater, which was measured and collected, depends on the regional rainfall, made the calculation formula, and developed a web-based tool. In addition, the tool was developed to calculate the formula from the data obtained, based on the groundwater level fluctuations due to the groundwater, which state effectively to identify the data management techniques to make island groundwater more efficient and scientific management .

For further study, based on the research of data analysis and data management techniques, a visual approach, which is a dynamic factor required for the efficient management will be studied in the future.

5.Acknowledgement

The authors would like to thank Bong Kwon Lee, Jin Ho Ko, Jin Woo Oh, and Soon Hee Im for providing some help with this work.

References

[1] Knowledge Economy, a leading economic industry in Jeju Regional Project Plan, 2009

[2] Jeju Korea Institute of Geoscience and Mineral Resources Division of geothermal water, stable water supply system for the future business Clean Island, Korea Institute of Geoscience and Mineral Resources Annual Report, 2004.

[3] Jeju Island, Korea Water Resources Corporation, Island hydrology and water resources, a comprehensive geological survey, 2003.

[4] Science and Technology of Education, , Korea Research Foundation, 2009 Future Fusion Technology Forum - Technology convergence through the competitive era, and we select -, 2009.